TEMPORARY TRAFFIC CONTROL PLAN DEVELOPMENT WORKSHOP

Local Sponsor:

Kauai County, HI
Instructors

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Introductions
FHWA WORK ZONE SAFETY GRANT PROGRAM

SAFETEA-LU (2005)
- FHWA Work Zone Safety Grant Program

2006 Work Zone Safety Grant
- Utility Work Zone Guidance, Training and TTCP Software Tool

2011 Work Zone Safety Grant
- Urban Work Zones
- Short-Term, Short-Duration, and Mobile Work Zones
- Comprehensive TTCP Software Tool
- Compendium of Documents
Purpose:
- Understanding critical characteristics of work zones
- Collecting missing roadway and traffic data
- Selecting appropriate typical applications or standard plans
- Modifying TA using site-specific data
- Field adjustments

Outcome:
- Use of TTCP development process
- Use of TTCP software
- Field modification and strategies
AGENDA

- Work Zone Traffic Control and Background
- Steps for Developing an Effective TTCP
- Temporary Traffic Control Plan Selection Software Demonstration
- Utility Work Zones & Case Studies
- Lunch
- Utility Work Zones & Case Studies (Cont.)
- Short-Term, Short-Duration, and Mobile Work Zones & Case Studies
- Work Zone Safety Compendium of Documents Demonstration
Training is based on national standards

State and local standards *always* supersede

Feel free to comment or ask questions
Workzone.eng.wayne.edu

- Provides access to:
  - TTCP Software
  - Compendium of Documents
  - Case Studies
  - Guidelines and Training Materials (in draft)
Urban Work Zone Module Evaluation Form

Please circle the agency best describes your employer:  
Road Agency/DOT  Utility Company/Agency  
Consultant  City/County Services  
Road Contractor  Other: ____________________________

Please provide your evaluation of the training workshop for each of the modules covered in the workshop by circling the rating appropriate for each question presented below.

Please note that the numerical rating scores are:  
1 = Poor 5 = Excellent

A. Please rate the following with respect to the Urban Work Zone training module:

1. Appearance of the visual aids: 1 2 3 4 5
2. Content: 1 2 3 4 5
3. Presenters: 1 2 3 4 5
4. Opportunity to ask question(s) and discussion: 1 2 3 4 5
5. Program organization: 1 2 3 4 5
6. Program length: 1 2 3 4 5
7. Program format: 1 2 3 4 5
8. Classroom size: 1 2 3 4 5
9. Class layout: 1 2 3 4 5
10. Relevance and usefulness of topics: 1 2 3 4 5
11. Overall presentation: 1 2 3 4 5

B. Please indicate the amount of time devoted to each subject within the Urban Work Zone training module:

1. Characteristics of Urban Work Zones:  
   - Much too short  - Too short  - Just right  - Too long  - Much too long

2. Temporary Traffic Control Strategies:  
   - Much too short  - Too short  - Just right  - Too long  - Much too long

Temporary Traffic Control Plan Development Workshop, Fond Du Lac, WI  
June 27th, 2014

Urban Work Zone Traffic Control Training
Post-Test

NAME: ____________________________

In order to evaluate the effectiveness of this training program, it is necessary to gauge the knowledge gained by the participants after completing the course. The results of this test will be used as a part of this evaluation. Consequently, your best effort on this test would be greatly appreciated and will aid in improving the training program.

1. Urban work zones often possess the following characteristics (check all that apply):
   - Limited access points
   - Limited right-of-way
   - Pedestrians and bicyclists
   - Posted speeds greater than 50 mph
   - High density of intersections and/or driveways

2. Temporary traffic control signals should only be used when other means are ineffective or inappropriate.
   Circle: True or False

3. Closing high-volume turn lanes typically will not cause disruption to traffic.
   Circle: True or False
TEMPORARY TRAFFIC CONTROL PLAN DEVELOPMENT

Process for Developing an Effective Temporary Traffic Control Plan
Opinions, findings, and conclusions expressed in this presentation are those of contractor(s) and not necessarily those of USDOT or FHWA.

Materials prepared under contract with FHWA.

Content is ‘living’ and subject to change.
Part 6 of the MUTCD

- Temporary Traffic Control
- Guidance, Standards, Devices, etc.

2009 MUTCD includes 46 ‘Typical Applications’
Typical applications include:

- Necessary Temporary Traffic Control Devices
  - Signs
  - Channelizing Devices
  - Optional Devices

- Dimensions for TTC Layout
  - Placement of Advance Warning Devices
  - Taper Lengths
  - Spacing Between Channelizing Devices

- Special Notes
Guidance:
1. The situation depicted can be simplified by closing one or more of the intersection approaches. If this cannot be done, and/or when capacity is a problem, through vehicular traffic should be directed to other roads or streets.
2. Depending on road user conditions, flagger(s) or uniformed law enforcement officer(s) should be used to direct road users within the intersection.

Standard:
3. At night, flagger stations shall be illuminated, except in emergencies.

Option:
4. Flashing warning lights and/or flags may be used to call attention to the advance warning signs.
5. For short-duration work operations, the channelizing devices may be eliminated if a vehicle displaying high-intensity rotating, flashing, oscillating, or strobe lights is positioned in the work space.
6. A BE PREPARED TO STOP sign may be added to the sign series.

Guidance:
7. When used, the BE PREPARED TO STOP sign should be located before the Flagger symbol sign.
8. ONE LANE ROAD AHEAD signs should also be used to provide adequate advance warning.

Support:
9. Turns can be prohibited as required by vehicular traffic conditions. Unless the streets are wide, it might be physically impossible to make certain turns, especially for large vehicles.

Option:
10. Vehicle hazard warning signals may be used to supplement high-intensity rotating, flashing, oscillating, or strobe lights.

Standard:
11. Vehicle hazard warning signals shall not be used instead of the vehicle’s high-intensity rotating, flashing, oscillating, or strobe lights.
Cover “variety of situations commonly encountered”
Not every possible situation addressed
Combining components of two or more TAs:
  ▶ For example:
    ▶ Closure at the Side of an Intersection (TA-27) WITH
    ▶ Sidewalk Detour or Diversion (TA-28)
2009 National MUTCD

- Minimum national standard
- States must either:
  - Adopt National MUTCD
  - Adopt National MUTCD with State Supplements
  - Adopt State MUTCD in “substantial conformance” with 2009 National edition
- State-level MUTCD or supplement may be more rigorous
MUTCD BY STATE

Adoption of the national MUTCD
Adoption of the national MUTCD along with a State supplement(s)
Adoption of a State MUTCD
DEVELOPMENT OF TTCP

1. Work and Site Characteristics
2. Determine Appropriate TA
3. Modify TA Based on Unique Characteristics
4. Develop Appropriate TTCP
5. Field Modification
STEP 1: OBTAIN SITE AND WORK CHARACTERISTICS

Site Characteristics
- Geometric characteristics (lane width, number of lanes, etc.)
- Existing traffic control (location of devices, posted speed limit, etc.)
- Traffic characteristics (both motorized and non-motorized)
- Environmental or other surrounding characteristics

Work Characteristics
- Proposed work activity
- Proposed work duration (including upper and lower bounds)
- Necessary workers, vehicles, and equipment
- Additional special considerations
TTCP DEVELOPMENT CHECKLIST

Work Characteristics

Roadway Characteristics
  ▶ Traffic
  ▶ Geometrics

Checklist
http://workzone.eng.wayne.edu/Software/CheckList/CheckList.html
STEP 2: DETERMINE APPROPRIATE TYPICAL APPLICATION (TA)

Select appropriate ‘Typical Application’ from the MUTCD,

- Consider state MUTCDs, standard plans, as well as local regulations
- TA or “Example Plan” from the TTCP Selection Software

Selecting a TA or Example Plan is **NOT** the last step

- Actual field conditions
- Specific work conditions
STEP 3: MODIFYING TA FOR SITE AND WORK CHARACTERISTICS

Consider supplementary notes or information
- MUTCD
- “Example Plans” in TTCP Selection Software

Field conditions will vary from generalized scenario

Consider the unique characteristics of the work zone
- Following modules from this training
- Use professional engineering judgment
STEP 4: DEVELOP TEMPORARY TRAFFIC CONTROL PLAN

Temporary traffic control plans may include:

- Detailed schematic of TTC
- Instructions for field personnel
- Project coordination strategies

Some WZ’s may be a “significant project” and require additional TMP components
Due to the **Rule on Work Zone Safety and Mobility**, operations which are deemed “**significant projects**” require:

- Temporary Traffic Control Plan
- Public Information Strategies
- Transportation Operations Strategies

**Significant projects defined as:**

Section 630.1010 of the Rule defines a significant project as one that, alone or in combination with other concurrent projects nearby, is anticipated to cause sustained work zone impacts that are greater than what is considered tolerable based on State policy and/or engineering judgment. All Interstate system projects within the boundaries of a designated Transportation Management Area (TMA) that occupy a location for more than three days with either intermittent or continuous lane closures shall be considered as significant projects.
STEP 5: MODIFY BASED ON FIELD CONDITIONS

- Fixed objects
- Existing signs
- Sight distance issue
- Work vehicle storage
- Pedestrian access
TEMPORARY TRAFFIC CONTROL PLAN SELECTION SOFTWARE
Only 46 ‘Typical Applications’
  ▶ DO NOT cover all of the frequently encountered scenarios

Can be incorrectly implemented “As Is”
  ▶ Must be tailored to the specific scenario encountered
    ▶ Rarely verbatim the same as generalized scenario
WSU-TRG developed 72 “Example” Plans

- Supplement the existing 46 TAs
- Cover many additional work zone scenarios that are frequently encountered
- Based on state of the art and practice in highway work zones
  - Best practices in individual states
  - Up to date research literature
- Reviewed by the FHWA, national focus group, and experienced professional work zone consultant
TEMPORARY TRAFFIC CONTROL SELECTION SOFTWARE

Combination of:
- 46 ‘Typical Applications’ from 2009 MUTCD
- 72 additional “example” plans
- State-specific standard drawings

Separated into EIGHT distinct modules

Navigate flow chart logic to arrive at appropriate plan
- Additional drop down menus for site-specific information
SYSTEM REQUIREMENTS

Web-based software tool compatible with:

- Personal computers (Windows, and Apple OS)
- Tablets and mobile devices (iOS, Android, Windows Mobile)

Compatible browsers include:

- Mozilla Firefox
- Google Chrome
- Microsoft Internet Explorer
- Apple Safari
Comprehensive list of the plans available for each state

- Should always be checked first for appropriate state-level plans

Standard plans are updated periodically by WSU-TRG

INSTRUCTIONS

Select items from the following dropdowns to find relevant standard plans or typical applications maintained by each state.

Wayne State University - Transportation Research Group updates these state related links on a periodic basis. The date WSU-TRG last updated each of the state’s links is shown. The "State DOT’s Standards" button links directly to the state’s standards web page which should be checked for changes that affect the relevance of these plans.
Assuming that the State of Hawaii is selected:
STATE-SPECIFIC EXAMPLE

Returns User to Work Zone Safety Homepage

Link to the Individual State’s Standard Plans Page

Most Recent Update of State Plans

Clicking any one of the links will direct the user to a PDF of that plan.
Remember to always check for state-specific versions of the work zone scenario!
Selecting a specific category will filter the results.
### ADDITIONAL STATE EXAMPLES

**Select the State**
- Florida

**Select the Category**
- Two-Lane Two-Way

<table>
<thead>
<tr>
<th>Type</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Plans</td>
<td>All Temporary Traffic Control Plans</td>
</tr>
<tr>
<td>Standard Plan</td>
<td>Two-Lane Two-Way, Mobile Operations Work On Shoulder, Work Within The Travel Way</td>
</tr>
<tr>
<td>Standard Plan</td>
<td>Two-Lane Two-Way, Work Outside Shoulder</td>
</tr>
<tr>
<td>Standard Plan</td>
<td>Two-Lane Two-Way, Work On Shoulder</td>
</tr>
<tr>
<td>Standard Plan</td>
<td>Two-Lane Two-Way, Work Within The Travel Way</td>
</tr>
<tr>
<td>Standard Plan</td>
<td>Two-Lane Two-Way, Work Within The Travel Way - Automated Flagger Assistance Devices</td>
</tr>
<tr>
<td>Standard Plan</td>
<td>Two-Lane Two-Way, Work In Intersection</td>
</tr>
<tr>
<td>Standard Plan</td>
<td>Two-Lane Two-Way, Work Near Intersection</td>
</tr>
<tr>
<td>Standard Plan</td>
<td>Two-Lane Two-Way, Work Within The Travel Way Signal Control - Single Lane Closure, Roadway And Bridges All Lengths</td>
</tr>
</tbody>
</table>

Clicking any one of the links will direct the user to a PDF of that plan.
Remember to always check for state-specific versions of the work zone scenario!
ADDITIONAL STATE EXAMPLES

INSTRUCTIONS

Select items from the following dropdowns to find relevant standard plans or typical applications maintained by each state.

Wayne State University - Transportation Research Group updates these state related links on a periodic basis. The date WSU-TRG last validated each of the states links is shown. The "State DOT's Standards" button links directly to the states standard design files. Please stay tuned for updates and changes that affect the relevance of these plans.

Select the State

Florida

Select

Other

Divided Multi-Lane

Intersection

Two-Lane Two-Way

Undivided Multi-Lane

Selecting a specific category will filter the results
Selecting “intersection” will provide the plans related to intersections in Florida.

<table>
<thead>
<tr>
<th>Type</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Plans</td>
<td>All Temporary Traffic Control Plans</td>
</tr>
<tr>
<td>Standard Plan</td>
<td>Multi-Lane, Work In Intersection</td>
</tr>
<tr>
<td>Standard Plan</td>
<td>Multi-Lane, Work Near Intersection Median Or Outside Lane (Right Lane)</td>
</tr>
<tr>
<td>Standard Plan</td>
<td>Multi-Lane, Work Near Intersection Median Or Outside Lane (Left Lane)</td>
</tr>
<tr>
<td>Standard Plan</td>
<td>Multi-Lane, Work Near Intersection Center Lane</td>
</tr>
<tr>
<td>Standard Plan</td>
<td>Multi-Lane, Work Near Intersection Two Lanes Closed - 45 Mph Or Less</td>
</tr>
<tr>
<td>Standard Plan</td>
<td>Two-Lane Two-Way, Work In Intersection</td>
</tr>
<tr>
<td>Standard Plan</td>
<td>Two-Lane Two-Way, Work Near Intersection</td>
</tr>
<tr>
<td>Standard Plan</td>
<td>Converting Two Lanes To Four Lanes Divided, Urban</td>
</tr>
</tbody>
</table>

Clicking any one of the links will direct the user to a PDF of that plan.
Remember to always check for state-specific versions of the work zone scenario!
INSTRUCTIONS

Select items from the following dropdowns to find relevant standard plans or typical applications maintained by each state.

Wayne State University - Transportation Research Group updates these state related links on a periodic basis. The date WSU-TRG last updated each of the state's links is shown. The "State DOT's Standards" button links directly to the state's standards web page which should be checked for changes that affect the relevance of these plans.

Selecting a specific category will filter the results.
Selecting “other” will provide the plans which are not specifically categorized from Florida.

<table>
<thead>
<tr>
<th>Type</th>
<th>Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Plans</td>
<td>All Temporary Traffic Control Plans</td>
</tr>
<tr>
<td>Standard Plan</td>
<td>Traffic Pacing Guide</td>
</tr>
<tr>
<td>Standard Plan</td>
<td>Pedestrian Control For Closure Of Sidewalks</td>
</tr>
<tr>
<td>Standard Plan</td>
<td>Limits Access Temporary Opening</td>
</tr>
<tr>
<td>Standard Plan</td>
<td>Toll Plaza Traffic Control Standards</td>
</tr>
<tr>
<td>Standard Plan</td>
<td>Motorist Awareness System</td>
</tr>
</tbody>
</table>

Clicking any one of the links will direct the user to a PDF of that plan.
ADDITIONAL STATE EXAMPLES

- Some items in the state-specific module may include summary tables or notes.

- Some plans or items may involve multiple page PDFs.

- In general, each state’s list will contain all of the standard plans, typical applications and notes from that state.
“Example” plans originally developed as a part of 2006 FHWA Work Zone Safety Grant

Similar to “Typical Application’ counterpart in the MUTCD

- Temporary traffic control devices geared towards utility work zones
- Short or intermediate term operations
- Still compliant to National MUTCD
UTILITY WORK ZONE MODULE

Advance through flow chart logic to appropriate TTCP

Users will be re-directed to the appropriate module as necessary

Clicking an object in the flow chart will skip to that portion of the logic
Once an object is clicked on any flowchart, the user will be prompted with questions about the roadway and work site in question.
Suppose a TTCP is required for the following utility work zone:

- Utility work on shoulder of a two lane roadway
- Work does not encroach onto roadway
- Urban roadway with 45 MPH posted speed limit
- Moderate traffic volumes
- 11’ wide travel lanes with 10’ paved shoulders
Begin at the **Main Module** of the TTCP Software

Since this is a Utility Work Zone, the **Utility Work Zone Module** should be selected
Utility Work Zone Module

- Plans relevant to utility work zones

Either answer every question in the logic or skip ahead by clicking the appropriate question object.
The first relevant question for this example involves the location of the utility work.

Given that we know the work in question is taking place on the shoulder only, selecting "On Shoulder" is appropriate.
‘Sub-modules’ cover specific roadway scenarios

- **Utility Work Zone “On Shoulder” Sub-Module**

- Introduce a new flowchart specific to that roadway scenario

Given that we know the work is taking place on a two-lane roadway and does not have low volumes and low speed, **Figure D3** is the most appropriate TTCP.
Additional information about the work being performed or roadway conditions may be necessary after the appropriate plan is selected.

Entered via the drop down menus.
A table will be shown which displays the appropriate dimensions for the layout of TTCDs. The table includes the following:

<table>
<thead>
<tr>
<th>DIMENSIONS</th>
<th>FEET</th>
</tr>
</thead>
<tbody>
<tr>
<td>A (Distance Between Signs)</td>
<td>350</td>
</tr>
<tr>
<td>L (Merging Taper Length)</td>
<td>450</td>
</tr>
<tr>
<td>1/3 L (Shoulder or Parking Lane Taper Length)</td>
<td>150</td>
</tr>
<tr>
<td>Maximum Taper Channelizing Device Spacing</td>
<td>45</td>
</tr>
<tr>
<td>Maximum Tangent Channelizing Device Spacing</td>
<td>90</td>
</tr>
</tbody>
</table>

Please note that this plan is an "Example" Typical Application developed by the WSU-TRG as a part of the 2011 FHWA Work Zone Safety Grant and may be used as a basis for preparing a temporary traffic control plan.

Buttons are included at the top which allow the user to:
- Return to Work Zone Safety Homepage, the Main Module, or the previous module
- A display of the legend/symbols
- Printing and zoom functions
INTERSECTION MODULE

- Includes ‘typical applications’ and “example” plans appropriate for use in the vicinity of highway intersections.

- Incorporates the **Roundabout Work Zone** sub-module, including “example” plans developed specifically for roundabouts.
  - Not covered in the 46 TAs.
Suppose a TTCP is required for a signalized intersection:

- Two approach lanes in the direction where the work is occurring
- Work on the far side of the intersection in the left lane
- Urban area with 40 MPH posted speed limit
- No shoulder with 11 foot wide travel lanes
- Work will interfere with the crosswalk
INTERSECTION EXAMPLE

Following through the flow chart logic within the **Intersection Module**, the user will be directed to dynamic questions page for TA 6H-23

Enter the additional work and site characteristics to determine the appropriate plan
A button is included which will display the typical application for pedestrian detours since crosswalks are affected.
Suppose a TTCP is required for a single-lane roundabout with the following characteristics:

- Urban roadway with 40 MPH posted speed limit
- 11 feet wide travel lanes with no shoulders
- 7 foot closure within the circulating lane
A button is included which will display the typical application for roundabout detour due to the closure.
Includes ‘typical applications’ and “example” plans specific to mobile work zone operations

Generalized plan for mobile striping operations not included in the MUTCD

Expansion of TA 6H-35 for two and three lane scenarios
WORK ZONE DETOUR MODULE

- Includes the ‘typical applications’ for detours required for various types of highway work zone scenarios
- Specific plans are included for roundabouts and pedestrians detours as necessary within the software
Includes ‘typical applications’ and “example” plans specific to operations taking place on the freeway

“Example” plans greatly expand on the variety of possible roadway geometries and work locations involved in freeway operations beyond the MUTCD
Suppose a TTCP is required for shoulder work on an urban freeway

- Left shoulder work (median side)
- 6 feet wide shoulder with 12 feet wide travel lanes
- Complete closure of shoulder
- 70 MPH posted speed limit

Within the **Freeway Module**, shoulder only work can be selected.
Whenever an “example” plan is shown, a disclaimer will indicate that the plan is not a TA from the MUTCD.
TWO-LANE WORK ZONE MODULE

- Includes ‘typical applications’ and “example” plans specific to operations taking place on two-lane roadways

- “Example” plans for haul roads beyond TA 6H-14, for long-term and short-term scenarios
MULTI-LANE WORK ZONE MODULE

- Includes ‘typical applications’ and “example” plans specific to operations taking place on multi-lane highways.
- Does not cover work zone scenarios beyond three lanes in one direction.
- Specific plans for short, intermediate, and long term scenarios.
Suppose a TTCP is required for a multi-lane highway which includes a two-way left turn lane

- Five foot closure within the two-way left turn lane
- Rural highway with posted speed limit of 40 MPH and 11 feet wide travel lanes

Skip to the portion of the multi-lane module which relates to highways with two-way left turn lanes
Optional TTC may also be shown in the plan, such as the optional high-level warning device shown in Example Plan 32I.
EVALUATIONS
UTILITY WORK ZONE
TRAFFIC CONTROL
TRAINING
PRE-TEST
Opinions, findings, and conclusions expressed in this presentation are those of contractor(s) and not necessarily those of U.S.D.O.T. or F.H.W.A.

Prepared in cooperation with U.S.D.O.T. and F.H.W.A

Utility work zone guideline is a ‘Living Document’ and may be modified and updated as needed.
WHO IS IT FOR?

- Safety Professionals
- State and Local Road Agencies
- Permit Granting Agencies
- Consultants
- Contractors
- Utility Workers
AGENDA

- Introduction
- Underlying Principles of Utility Work Zone Traffic Control
- Utility Work Zone Traffic Control
- Break
- Suggested Traffic Control Plans & Pedestrian Issues
Utility Work Zone Guidelines

Significant variability in the knowledge, skills, and abilities of the utility workforce

Variability is associated with a level of risk for workers and motorists
Guideline document provides uniform treatment
  ▶ TTCPs for various utility work zone applications

Guidance is provided to aid the utility workforce
  ▶ Identify level of risk
  ▶ Mitigating risks
WHAT TYPE OF UTILITY WORK IS INCLUDED?

- Electrical, Gas, Telephone, Cable
- Traffic Signals
- Water
- Sewer Maintenance and Cleaning
- Landscaping
- Others
DIFFERENCES BETWEEN UTILITY WORK ZONES AND NORMAL WORK ZONES

- Shorter duration
- May require more time to set-up and remove traffic control than to complete work
- Often unplanned or unscheduled
- Often outside of travel way
- Smaller work area
- Smaller work crew
- Same work crew attends multiple work sites
WHAT IS NOT INCLUDED?

- Nighttime utility work
- Utility work conducted on freeways
- Long term stationary
- Utility work as a part of long term highway project
MANAGEMENT PERSPECTIVE

- Recognition of safety and mobility in work zones
- Providing appropriate tools
- Making training readily available
- Emphasizing uniformity
- Encouraging safety culture
MUTCD WORK ZONE DURATION
DEFINITIONS

- **Long-term stationary** is work that occupies a location more than 3 days

- **Intermediate-term stationary** is work that occupies a location more than one daylight period up to 3 days, or nighttime work lasting more than 1 hour
**MUTCD WORK ZONE DURATION
DEFINITIONS**

- **Short-term stationary** is daytime work that occupies a location for more than 1 hour within a single daylight period.

- **Short-duration** is work that occupies a location up to 1 hour.

- **Mobile** is work that moves intermittently or continuously.
“Simplified control procedures may be warranted for short-duration work. A reduction in the number of devices may be offset by the use of other more dominant devices such as high-intensity rotating, flashing, oscillating, or strobe lights on work vehicles.”

Source: MUTCD Section 6G.02
“Appropriately colored or marked vehicles with high-intensity rotating, flashing, oscillating, or strobe lights may be used in place of signs and channelizing devices for short-duration or mobile operations.”

Source: MUTCD Section 6G.02
SHORT TERM AND SHORT DURATION NEED

- Standardized plans
- Workers realize need for traffic control
- Different traffic control devices than long and intermediate term work
  - Fewer devices
  - Portable devices
PASSING MOTORIST NEED

- Early recognition
- Clear recognition of potential hazard
- Positive guidance
- Driver expectancy maintained through the work zone
PURPOSE OF UTILITY WORK ZONE
TRAFFIC CONTROL

- Safe and efficient travel of all road users
- Worker protection
WORK ZONE CRASH FATALITIES

- 609 work zone fatalities in 2012 (one every 14 hours)
- Approximately half occur during daytime hours
- Twice as high during the week than weekend
- Mostly occur during the summertime
- Over half involve single motor vehicles
- Utility work zone fatalities are 14 per year
- 10% underreporting of work zone fatalities
  (Ullman & Scriba)
UTILITY WORK ZONE CRASH RISK FACTORS

- Traffic volume
- Travel speed
- Lateral distance from travel lanes
- Work duration – time to complete the work
- Sight distance and work area visibility
- Others
PREVENTION OF WORK ZONE CRASHES

“Analyze the work site including traffic patterns and plan the work zone before you begin working”

“Position work vehicles to create an obstacle to prevent oncoming traffic from hitting you”

Source: NIOSH FACE Program, 2007
PREVENTION OF WORK ZONE CRASHES

“Minimize exposure to moving traffic”

“Drivers should not engage in activities that distract them from driving or hinder driving performance”

Source: NIOSH FACE Program, 2007
EARLY RECOGNITION OF UTILITY WORK ZONE BY MOTORISTS

- Evasive action taken to avoid a traffic crash if motorist recognizes work zone
- TTC provides information about potential hazard
- Information is provided through signs, cones, drums, barriers, etc.
EARLY RECOGNITION OF UTILITY WORK ZONE BY MOTORISTS

- Uniformity of treatment
- Making utility work zones conspicuous to the passing motorist - orange color
- Treatments must consider driver expectancy
Driver expectancy relates to the readiness of the driver to respond to events, situations, or the presentation of information.

Source: A Users’ Guide to Positive Guidance - FHWA
Driver Expectancy

- Gained through experience and training
- Guided by traffic control devices
- Drivers respond quickly and correctly
- Information must be clear
- Consistency decreases reaction time
- Uniformity simplifies driving tasks
DRIVER EXPECTANCY VIOLATED

- Occurs when uncommon/unique situations arise
- Drivers require longer response times
- Greater chance of error
- Work zones naturally violate drivers’ expectancy
“Positive guidance information increases the driver’s probability of selecting the speed and path most appropriate to the operating conditions of the highway.”

“Positive Guidance is based on the premise that competent drivers can be given appropriate information about hazards and inefficiencies to avoid errors.”

Source: *A Users’ Guide to Positive Guidance* - FHWA
BASIC DRIVING TASK

Control – driver’s interaction with vehicle
Guidance – driver’s ability to maintain safe path on highway
Navigation – driver’s ability to plan and execute trip from point of origin to destination

Source: Alexander, G.J., “Some Factors Affecting Reception and Use of Information by Drivers”, Public Road, Vol. 37, No. 1
PROCESS OF INFORMATION HANDLING

1. Detect a Hazard
2. Recognize a Hazard as Such
3. Decide on an Appropriate Speed and Path
4. Act on the Speed Path Decision

Source: Federal Highway Administration, A Users’ Guide to Positive Guidance
WHAT IS A “SAFETY CULTURE”? 

“The safety culture of an organization is the product of individual and group values, attitudes, perceptions, competencies and patterns of behavior that determine the commitment to, and the style and proficiency of, an organization’s health and safety management.”

Source: HSC, 2003
CRASH CAUSAL FACTORS

- Work zone crashes have several potential causes
  - Driver, Environment, Vehicle
  - Organizational, Worker

- Understanding of causes that leads to prevention

- Establishment of policies and procedures

- Crashes are not a result of any one factor
  - Failure of individuals to perform duties
  - Breakdown in safety-related policies and procedures
  - Managerial failure
SOME OF THE CAUSAL FACTORS ARE BEYOND OUR CONTROL
BUT SOME ARE NOT!
WHAT CONSTITUTES A GOOD UTILITY WORK ZONE SAFETY CULTURE?

- Commitment to safety by management
- Commitment to safety by workers
- Realistic rules and regulations
- Continuous worker training
- Monitoring of performance
UTILITY WORK ZONE
TRAFFIC CONTROL
UTILITY WORK ZONE TRAFFIC CONTROL GUIDELINES

- Developed and revised for FHWA Work Zone Safety Grants
- Include suggested traffic control plans
- Temporary traffic control devices
- Meant for electrical, gas, telephone, cable, water, sewer, street lights, traffic signals, landscaping, others
- Not meant for nighttime or freeway work

U.S. Department of Transportation
Federal Highway Administration
NEED FOR UTILITY WORK ZONE GUIDELINES

- Shorter in duration
- Different traffic control needed
- Change in travel environment for drivers
- Improve mobility
- Reduce utility work zone crashes
PERCEPTION REACTION TIME OF DRIVERS

**Perception:** recognition or realization that cue or stimulus exists that requires response

**Intellection:** Identification of cue or stimulus

**Emotion:** determination of appropriate response to cue or stimulus

**Volition:** physical response that results from decision
UNIFORMITY

- Treatment of similar work site with same traffic control
- Traffic control devices
- Color
- Strobe or oscillating lights
- Arrow panels
CONSPICUITY

- Increased through proper traffic control devices
- Using color of work zones – ORANGE
- Retro-reflective TCDs
- Work zones that stand out from other surroundings to passing motorists
BASIC REQUIREMENTS FOR TRAFFIC CONTROL DEVICES

- Fulfill a need
- Command attention
- Convey a clear, simple message
- Command respect from road users
- Give adequate time for proper response

Source: MUTCD Section 1A.02
TEMPORARY TRAFFIC CONTROL SIGNS

- Message, layout, and configuration per MUTCD
- Construction fluorescent orange color with microprismatic retro-reflective characteristics
- 2 orange supplemental flags may be mounted
- Size = 36” x 36”
- Crashworthy

Source: MUTCD
Figure 6F-2
TEMPORARY TRAFFIC CONTROL SIGNS

- Portable temporary traffic control signs
- Shall be mounted at least 1 foot above the traveled way
- Reduces traffic control setup and removal time
- Decreases worker exposure to risk especially for utility work zones

Source: MUTCD Figure 6F-2
POORLY MOUNTED SIGNS
ARROW PANELS

- Support panel 48” H x 96” W
- Minimum of 15 lamps
- Front panel with flat, non-reflective black background
- Mounted at minimum of 7’ from roadway to bottom of panel
- Flash Rate: 25-40 flashes per minute
CHANNELIZING DEVICES

- Provides guidance/delineation to motorists
- Need to be easily installed and removed
- Must be orange and contain retro-reflective bands
- Made of a material that will not damage a vehicle if impacted
- 36” or taller cones or tubular markers are more desirable

Source: MUTCD Figure 6F-7
CONES & BARRICADES

- Use orange taller cones with retro-reflective bands
- Provides increased visibility
- Transported easily
- Quick installation and removal on-site

Barricades
WARNING LIGHTS ON WORK VEHICLES

- Attract the attention of road users
- Potentially hazardous situation
- Sufficient time for taking appropriate action
- Warning light standardization desirable
- Promote driver understanding
- Recognition of lights on work vehicles
Warning lights should be visible to drivers from all angles (360 degrees)

Larger vehicles should be equipped with a minimum of three warning lights

Warning lights should be amber in color
WARNING LIGHTS ON WORK VEHICLES

⚠️ Warning lights should be TURNED ON!
RETRO-REFLECTIVE MARKINGS ON WORK VEHICLES

Visibility increased by the use of retro-reflective markings and appropriate vehicle colors

Should supplement warning light systems

Affixed to the back of utility work vehicles
Visibility of work vehicle very important
Orange vehicle is visual cue of approaching work zone
Consistency in colors improves early recognition
Increases driver awareness and recognition of work zone
WORK VEHICLE COLOR ORANGE

Desirable Vehicle Colors

Undesirable Vehicle Colors
WORK VEHICLE PLACEMENT

- Place upstream to warn vehicles of an upcoming work zone and shield workers from traffic.
- Place equipment trailers downstream of work area to avoid being hit by traffic.
IMPROPER PLACEMENT OF WORK VEHICLES OR DEVICES
IMPROPER PLACEMENT OF WORK VEHICLES OR DEVICES
Vehicle-mounted, boom-supported aerial platforms
- Cherry pickers, bucket trucks, etc.

26 worker fatalities per year due to the user of aerial lifts*
- More than half due to bucket trucks

Positioning of any vehicle on the highway pavement or shoulder requires proper traffic control compliant to the MUTCD

*Center to Protect Workers Rights - 2004
AERIAL LIFT SAFETY

- States may have their own policy or guidelines
- Temporary traffic control will be dependent on the work duration
- Chapter 6 of MUTCD
- No one standard traffic control plan
  - Should be prepared by trained professional
HOW WOULD YOU LIKE TO DRIVE UNDERNEATH THIS?
AERIAL LIFT SAFETY

For aerial lift truck use at mid-block locations:

- Use of TMAs can help to decrease the impact forces of errant vehicles
- Additional consideration must be given if the bucket must be extended over the roadway
  - Buckets should not extend over active traffic
  - Consider the use of flaggers if additional closures are impractical to implement
AERIAL LIFT SAFETY

For aerial lift truck use in the vicinity of a highway intersection:

- Mount signs on portable stands
- All approaches
- Buckets should not be extended over active traffic
For aerial lift truck use within an intersection:

- Retro-reflective markings and high-level warning devices
- 10 foot minimum clearance required to maintain each approach
- “Narrow Lane Ahead” signs warn motorists of the reduced downstream lane widths
SET-UP AND REMOVAL OF DEVICES

- Spend least amount of time necessary to set-up and remove devices safely and correctly
- Perform work as expeditiously as possible to reduce exposure
- Decreasing exposure time increases safety
- Use devices that are easily transported
SET-UP OF TRAFFIC CONTROL DEVICES

- Identify traffic control plan ahead of time
- Plan and discuss traffic control off roadway
- Park work vehicles and equipment to maximize safety
- Place traffic control devices as per selected plan starting at beginning of work zone
REMOVAL OF TRAFFIC CONTROL DEVICES

- Start at end of work zone
- Remove temporary traffic control devices at the end of the workday
- Only leave in place what is needed
- Know where everything goes in work vehicle so no time is wasted
MUTCD Section 6D.03 requires “American National Standard For High-Visibility Safety Apparel and Headwear”

ANSI (American National Standards Institute) / ISEA (International Safety Equipment Association) 107-2004

Class 2 and 3 garments based on worker activities
FLAGGER (TRAFFIC REGULATOR) TRAINING

For flagger (traffic regulator) training information refer to The National Work Zone Safety Clearinghouse at http://www.workzonesafety.org/training/
SUGGESTED TRAFFIC CONTROL PLANS & PEDESTRIAN ISSUES
TEMPORARY TRAFFIC CONTROL COMPONENTS

- **Activity Area** – work space, traffic space, and buffer space.
- **Advanced Warning Area** – used to provide warning to motorists of an upcoming utility activity.
INSUFFICIENT ADVANCE WARNING

No advance warning signs

Missing advance warning signs telling which lane is closed
LANE CLOSURE WITH NO ADVANCE WARNING

Less than 8 feet
## DISTANCE BETWEEN TRAFFIC SIGNS

<table>
<thead>
<tr>
<th>Road Type</th>
<th>A (Distance Between Signs)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Urban</strong></td>
<td></td>
</tr>
<tr>
<td>≤ 50 km/h (30 mph)</td>
<td>30 m (100 ft)</td>
</tr>
<tr>
<td>&gt;50 km/h (30 mph)</td>
<td>100 m (350 ft)</td>
</tr>
<tr>
<td>Rural</td>
<td>150 m (500 ft)</td>
</tr>
</tbody>
</table>

Note: 30 mph used to differentiate between high and low speeds due to risks involved
**TEMPORARY TRAFFIC CONTROL COMPONENTS**

**Tapers** – gradual transition to direct traffic from normal paths to designated path, must be free of workers, vehicles, equipment, etc.
### Different Types of Tapers

<table>
<thead>
<tr>
<th>Type of Taper</th>
<th>Taper Length (L)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Merging Taper</td>
<td>at least L</td>
</tr>
<tr>
<td>Shifting Taper</td>
<td>at least 0.5L</td>
</tr>
<tr>
<td>Shoulder Taper</td>
<td>at least 0.33L</td>
</tr>
<tr>
<td>One-Lane, Two-Way Traffic Taper</td>
<td>30 m (100 ft) maximum</td>
</tr>
<tr>
<td>Downstream Taper</td>
<td>30 m (100 ft) per lane</td>
</tr>
</tbody>
</table>

Source: MUTCD Figure 6C-2 and Table 6C-3
### Formulas for Calculating Taper Lengths

<table>
<thead>
<tr>
<th>Speed Limit (S)</th>
<th>Taper Length (L)</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 km/h or less</td>
<td>( L = \frac{WS^2}{155} )</td>
<td>Meters</td>
</tr>
<tr>
<td>70 km/h or more</td>
<td>( L = \frac{WS}{1.6} )</td>
<td>Meters</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Speed Limit (S)</th>
<th>Taper Length (L)</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 mph or less</td>
<td>( L = \frac{WS^2}{60} )</td>
<td>Feet</td>
</tr>
<tr>
<td>45 mph or more</td>
<td>( L = WS )</td>
<td>Feet</td>
</tr>
</tbody>
</table>

Where:  
- \( L \) = taper length in meters (feet)  
- \( W \) = width of offset in meters (feet)  
- \( S \) = posted speed limit, or off-peak 85th-percentile speed prior to work starting, or the anticipated operating speed in km/h (mph)

Source: MUTCD Table 6C-4
**TEMPORARY TRAFFIC CONTROL COMPONENTS**

**Buffer Space (Optional)** – lateral and/or longitudinal area that separates traffic from work space, must be free of workers, vehicles, equipment, etc.
WHY USE BUFFER SPACE?

- Easy to accommodate into plan
- Inexpensive
- Improves worker safety
- Provides additional space between work zone and motorists
**TEMPORARY TRAFFIC CONTROL COMPONENTS**

- **Termination Area** – area used to return to normal path
- **Traffic Space** – portion of highway in which road users are routed through the activity area
TEMPORARY TRAFFIC CONTROL COMPONENTS

- **Transition Area** – area utilized to move motorists from their normal path.

- **Work Space** – portion closed to road users; occupied by utility workers, equipment and vehicles.
UTILITY WORK BEYOND SHOULDER

> 15 ft from edge of roadway or
> 2 ft behind curb where curb and gutter present
UTILITY WORK BEYOND SHOULDER WITH WORK VEHICLE(S) PARKED ON SHOULDER

> 15 ft from edge of roadway or
> 2 ft behind curb where curb and gutter present
UTILITY WORK ON SHOULDER
(LOW TRAFFIC VOLUME AND LOW SPEEDS)
UTILITY WORK ON SHOULDER WITH MINOR ENCROACHMENT
(HIGH TRAFFIC VOLUMES AND HIGH SPEED)

Note: 10’ Minimum Required
UTILITY WORK ON SHOULDER WITH MINOR ENCROACHMENT (HIGH TRAFFIC VOLUMES AND HIGH SPEED)
CENTER LANE CLOSURE ON A MULTI-LANE ROAD
“When existing pedestrian facilities are disrupted, closed, or relocated in a TTC zone, the temporary facilities shall be detectable and include accessibility features consistent with the features present in the existing pedestrian facility.”

- 2009 MUTCD
PEDESTRIAN ISSUES

- Must identify pedestrian needs
- Pedestrian paths must be maintained
- Should not be forced to enter into work zone
- Should not be forced to enter into roadway
- High pedestrian areas may require additional consideration
EXAMPLES OF IMPROPER PEDESTRIAN TRAFFIC CONTROL
PEDESTRIAN TRAFFIC CONTROL PLANS

- Pedestrian Detour for Sidewalk Closure
- Pedestrian Diversion for Sidewalk Closure
- Must be ADA Compliant
- Barrier or barricade detectable by a person with a visual disability is sufficient
SIDEWALK DETOUR FOR PEDESTRIANS
How do you select a proper traffic control plan?
TRAFFIC CONTROL PLAN SELECTION

- Location of utility work
- Traffic volume of adjacent road
- Travel speed of vehicles on adjacent road
- Location of lane closure
- Roadway type
LOCATION OF UTILITY WORK

📍 Beyond the shoulder - > 4.6 m (15 ft) from edge of roadway OR > 0.6 m (2 ft) beyond curb
📍 On the shoulder
📍 On the roadway
VOLUME AND SPEED OF ADJACENT ROAD

- Traffic volume of adjacent road – low volume or high volume
- Travel speed of vehicles on adjacent road – low speed $\leq 50$ km/hr (30 mph) or high speed $>50$ km/hr (30 mph)
LOCATION OF LANE CLOSURE

- Mid-Block
- Intersection – right lane on near side, left lane on near side, right lane on far side, left lane on far side, center of intersection
ROADWAY TYPE

- Rural vs. Urban
- Two-Lane vs. Multi-Lane

Lane Closure on Urban Multi-Lane Road

Lane Closure on Rural Two-Lane Road
(Poor layout of traffic control)
Further information on highway work zone safety can be found through the following organizations:

- FHWA Work Zone Safety and Mobility Rule: http://www.ops.fhwa.dot.gov/wz/resources/final_rule.htm
- American Road and Transportation Builders Association: http://www.artba.org/
- Institute of Transportation Engineers: http://www.ite.org/
- Occupational Safety and Health Administration: http://www.osha.gov/
- Texas Transportation Institute: http://tti.tamu.edu
- Transportation Research Board: http://www.trb.org/
Utility Example
Tree trimming work located adjacent to the intersection
Requires closure of right travel lane on near side of the intersection
Expected work duration is approximately 1-2 hours
STEP 1: COLLECT AND IDENTIFY NECESSARY SITE AND WORK CHARACTERISTICS

Site Characteristics

- Signalized four-leg intersection
- 25 MPH posted speed limit
- Affected roadway includes four lanes (10’ wide lanes)
- No paved shoulder
- Curb and gutter
- Commercial driveways and intersections within TTC area
- Moderate traffic volumes
STEP 1: COLLECT AND IDENTIFY NECESSARY SITE AND WORK CHARACTERISTICS

Work Characteristics

- Tree trimming work
- Work vehicle(s) may be present
- Expect workers on foot within the work area
- Work duration expected to be approximately 1-2 hours
STEP 2: SELECT APPROPRIATE TYPICAL APPLICATION

Temporary Traffic Control Plan Selection Software

- Workzone.eng.wayne.edu
- Follow the flowchart logic towards the appropriate plan
- Be sure to check for state-standards first!

OR select an appropriate typical application from the MUTCD without using the software

Which plan is the most appropriate for this scenario?
STEP 2: SELECT APPROPRIATE TYPICAL APPLICATION

Using the **TTCP Selection Software**, Figure T. is the most appropriate.

Dimensions and supplementary notes are provided based on the information entered into the drop down menus.

<table>
<thead>
<tr>
<th>DIMENSIONS</th>
<th>FEET</th>
</tr>
</thead>
<tbody>
<tr>
<td>A (Distance Between Signs)</td>
<td>100</td>
</tr>
<tr>
<td>B (Distance Between Signs)</td>
<td>100</td>
</tr>
<tr>
<td>C (Distance Between Signs)</td>
<td>100</td>
</tr>
<tr>
<td>L (Merging Taper Length)</td>
<td>105</td>
</tr>
<tr>
<td>Maximum Taper Channelizing Device Spacing</td>
<td>25</td>
</tr>
<tr>
<td>Maximum Tangent Channelizing Device Spacing</td>
<td>50</td>
</tr>
</tbody>
</table>
STEP 3: MODIFY TA BASED ON ADDITIONAL CONSIDERATIONS

Having selected a typical application or example plan, it must still be modified to fit the **specific work/site conditions**
STEP 3: MODIFY TA BASED ON ADDITIONAL CONSIDERATIONS

What is unique/different about the given scenario vs. the selected TA?

- Proposed work area adjacent to the intersection
- Expected short-term nature of the work activity
- Presence of commercial driveways and intersections within TTC area
- Presence of non-motorized facilities (sidewalks & crosswalks) along the affected roadway
STEP 3: MODIFY TA BASED ON ADDITIONAL CONSIDERATIONS

Merging taper within the intersection in advance of work area?
STEP 3: DEVELOP APPROPRIATE TEMPORARY TRAFFIC CONTROL PLAN

What about the placement of advance warning signs?

How do you handle this situation?

Potential Sign Locations

105'

100'

100'

100'

Proposed Work Area
STEP 3: MODIFY TA BASED ON ADDITIONAL CONSIDERATIONS

What aspects of the Figure T should be modified to fit the work/site conditions?

- Split the merging taper to provide access to the driveway
- Relocated the advance warning signs to avoid the driveway
- Provide advance warning sign on the cross-street
- Pedestrian detour may be added depending upon the pedestrian volume
STEP 4: DEVELOP OPTIMAL TEMPORARY TRAFFIC CONTROL PLAN

Final TTCP should include:

- Schematic drawing of the modified plan including:
  - All necessary temporary traffic control devices
  - Dimensions / layout of devices

- Supplementary notes or guidance for field personnel
  - Instructions on how to modify TTC for various field conditions
STEP 4: DEVELOP OPTIMAL TEMPORARY TRAFFIC CONTROL PLAN
Field conditions may vary from expectations
- Especially for unexpected or emergency work

Ensure TTC in place is appropriate for actual conditions
- Heavier than expected vehicular or pedestrian volumes
- More expansive work area than anticipated
- Duration exceeding one daylight period
- Other considerations
POST-TEST AND EVALUATIONS
TRAFFIC CONTROL STRATEGIES FOR SHORT-TERM, SHORT-DURATION, AND MOBILE WORK ZONES

Training Program
PRE-TEST
Opinions, findings, and conclusions expressed in this presentation are those of contractors and not necessarily those of USDOT or FHWA.

Materials prepared under contract with FHWA.

Content is ‘living’ and subject to change.
OUTLINE

- Background
- Purpose and Objectives
- Unique characteristics of Short-Term, Short-Duration, and Mobile (STSDM) Work Zones
- Temporary traffic control strategies
- Example plans
- Example problem(s)
Aging infrastructure = More work zones

Two work zone traffic control objectives:
  • Maintain safety
  • Maintain acceptable levels of mobility

Objectives don’t necessarily go hand-in-hand

Careful planning, design, and implementation of work zone traffic control
MUTCD Chapter 6

- Temporary traffic control (TTC) for work zones, incidents, etc.
- Typical Applications (TAs) of common work zone TTC scenarios

Adjust TAs to fit actual conditions

- What aspects may be modified?
- Under what conditions?
PURPOSE AND NEED

MUTCD gives limited TA modification guidance

| Need for additional detail beyond the MUTCD |

This training session provides:

| Issues to expect with STSDM |
| Strategies to address these issues |
| How to select and modify a TA |
| Examples of modified traffic control plans |
Short-term stationary occupies location > 1 hr within a single daylight period

Short-duration occupies location ≤ 1 hr

Mobile moves intermittently or continuously
Intermediate-term stationary occupies location

- 1 - 3 days (daytime work) or
- >1 hr (nighttime work)

Long-term stationary occupies location >3 days
OTHER GUIDELINES AND TRAINING

Other guidelines/training developed under this grant:
- Urban Work Zone TTC
- Utility Work Zone TTC
- Temporary Traffic Control Plan Selection Software
CONCERNS WITH SHORTER DURATIONS

Primary concern noted in MUTCD:

“It often takes longer to set up and remove the temporary traffic control zone than to perform the work. Workers face hazards in setting up and taking down the temporary traffic control zone. Also, since the work time is short, delays affecting road users are significantly increased when additional devices are installed and removed” – 2009 Federal MUTCD

Paradox

- Don’t put workers at risk with lengthy TTC setup
- Don’t compromise safety by using inadequate TTC setup

How can we minimize worker exposure while providing adequate TTC?
CHARACTERISTICS AND ISSUES
Short-Term, Short-Duration, and Mobile Work Zones
STSDM work possesses unique characteristics

- Typically related to the nature of the work
- Issues must be addressed during TTC layout

UPCOMING SLIDES

- Characteristics and associated issues

LATER ON

- Methods for addressing issues with appropriate TTC
UNIQUE CHARACTERISTICS OF STSDM

- Work may be unanticipated and/or urgent
  - Perhaps very urgent or emergency

- Associated lack of available planning time prior to implementation of TTC

- Setup and removal of TTC may take longer than performing the actual work
UNIQUE CHARACTERISTICS OF STSDM (CONTINUED)

- Lack of traffic barriers, temporary pavement markings, or other longer-duration TCDs
- Use of specialized vehicles or equipment
  - Especially for WZs which move intermittently or continuously
- Specific accessibility issues may occur
- Heavy reliance on field personnel
- Emphasizing safety over mobility
Certain events require immediate attention:

- Utility failures or damage
- Fallen trees or branches
- Traffic signal failures
- Damaged signs
- Damaged guardrail/barriers
- Localized pavement failures
UNANTICIPATED OR URGENT WORK

- Crews must quickly mobilize to perform the fix
  - Little time for preparation
  - TTC aspects may be overlooked
- Adequate advance notification may not be possible
  - Drivers will not expect work zone
  - Agencies may not be prepared
    - Police
    - Fire/rescue
    - Transit
Daytime work occupying a location for more than one hour within single daylight period

- Utility Work
- Traffic Hardware Installation
- Roadside Maintenance
- Placement of overhead structures
- Bridge/Structure Inspection
SHORT DURATION WORK

Work occupying a location up to one hour

Examples:

- Tree trimming
- Debris clearing
- Localized pavement maintenance
- Surveying
- Graffiti removal from signs
- Pavement markings (stop lines, legends)
SHORT DURATION WORK

Some work zones take longer to setup than the actual work

- Single setup
- Moving work area with several stops

Minimize TTC setup and removal time

- Minimize delays and worker exposure

Ensure adequate TTC regardless of duration

- Tendency to become complacent as duration decreases
- Drivers will not expect such short duration work

Simplification of TTC is key
LACK OF LONGER-DURATION TRAFFIC CONTROL DEVICES

- Use of certain TCDs may be impractical for STSDM WZs
- Complication of reducing TTC implementation time
  - Simplification of TTC
- Traffic barriers
- Temporary pavement markings
  - Other lane delineation devices
- Other more dominant TCDs
  - Barricades, PCMS, etc.
Specialized equipment is often necessary to minimize the work duration and/or provide worker protection:

- Striping trucks
- Aerial lift trucks
- Pavers
- Convoys

These vehicles may require special TTC when in use.
MOBILE WORK

Continuous movement examples (in vehicle):
- Roadway striping
- Certain paving operations
- Street sweeping
- Mowing

Intermittent movement examples (on foot or in vehicle):
- Pavement crack or joint sealing
- Pothole filling
- Debris cleaning after a storm
- Storm drain cleaning
ACCESSIBILITY ISSUES

Although STSDM work period is short, it may still impact:

- Pedestrians
- Bicyclists
- Access to homes and businesses
- On-street parking
- Public transit stops

Users may not know how to proceed if access is blocked

Workers should be prepared to deal with these issues
Short-term and short-duration work may involve:

- Limited time to plan and prepare
- Limited use of many dominant TCDs intended for use in longer-duration work
- Increased risk for both road users and workers

Field personnel can help to mitigate these concerns

- Situational awareness of changing field conditions
- Wearing proper equipment
- Ensuring proper use of TCDs
EMPHASIZING SAFETY OVER MOBILITY

- Advance warning
- Dominant TCD
- Lane closure
- Allowing temporary congestion due to lane closure to pass
- Avoid peak period work at roads with high volume
TRAFFIC CONTROL STRATEGIES

Short-Term, Short-Duration, and Mobile Work Zones
Unique issues may be addressed through proper TTC strategies.

Specific guidance is provided relating to:

1. Minimizing time to setup and remove TTC
2. Managing TTC for unexpected or emergency work
3. Managing continuous or intermittent movement
4. Maintaining access to intersections, driveways, and parking
5. Accommodating pedestrians and non-motorized users
6. Temporary re-opening of travel lanes
7. Accommodating special vehicles (striping trucks, aerial lifts)
1. MINIMIZING TIME FOR SETUP/REMOVAL

As work duration decreases, so should TTC setup time

- Minimize worker exposure
- Minimize delays

Methods to minimize TTC setup time:

- Reduce the number of TCDs
- Not cover/remove permanent TCDs
- Reduce spacing of channelizing TCDs
- Use lightweight signs and channelizing devices
- Use work vehicles to place channelizing devices

Certain criteria must be met
1. MINIMIZING TIME FOR SETUP/REMOVAL – USE OF VEHICLE-MOUNTED DEVICES

- Dominant vehicle-mounted devices may replace TTC devices for certain short-duration or mobile operations
  - High-intensity rotating, flashing, oscillating, or strobe lights
    - Does NOT include hazard flashers
  - Arrow boards or PCMS
  - Retro-reflective markings on appropriately colored vehicles
1. MINIMIZING TIME FOR SETUP/REMOVAL – ELIGIBLE CASES FOR VEHICLE MOUNTED DEVICES

- **Shoulder Work**
  - Ground-mounted signs and channelizing devices replaced by properly equipped vehicles

- **Shoulder Work Encroaching Travel Lane**
  - Taper and channelizing devices replaced by properly equipped shadow vehicle

- **Intersection Work**
  - Channelizing devices replaced by properly equipped vehicle

- **Work Beyond Shoulder**
  - Ground-mounted signs and channelizing devices replaced by properly equipped vehicles

- Consider other short-duration work on case-by-case basis
1. MINIMIZING TIME FOR SETUP/REMOVAL – ALTERNATIVES TO COVERING PERMANENT TCDS

⚠️ Permanent signs/markings may provide conflicting messages
  ▶ As work duration decreases, covering devices is not practical
  ▶ Use high visibility devices which emphasize proper path

⚠️ Short-term work
  ▶ Use channelizing devices with closer spacing
    ▶ Spacing (in feet) = 0.5*speed (in mph)
  ▶ Taller cones (42 inches or greater) may be used in lieu of drums

⚠️ Short duration/mobile work
  ▶ No additional action necessary
2. MANAGING URGENT/UNEXPECTED WORK

- Little time to plan/prepare for work zone setup
  - Details of site condition may be limited
  - Full compliment of TCDs may not be readily available
  - Use available devices until situation can be assessed

- React/respond to field conditions
  - Expand/move TTC as needed
  - Modify TTC if work takes longer than expected
    - Additional traffic control devices
    - Nighttime work
    - Overnight shutdown
3. MANAGING CONTINUOUS MOVEMENT - USING FULLY MOBILE TRAFFIC CONTROL

Often not practical to provide stationary TTC for

- Advance warning messages
- Channelization

MUTCD allows for dominant, vehicle-mounted TTC in lieu of stationary TTC devices

- PCMS or Static Signs
- Arrow Boards
- High-intensity rotating, flashing, oscillating, or strobe lights
3. MANAGING INTERMITTENT MOVEMENT - MOBILE VS. STATIONARY TRAFFIC CONTROL

Moving short-duration operations

- Some may be more well-suited for complete mobilization of TTC
- Others may move so slowly that retrieving stationary devices is more efficient

Considerations for mobile vs. stationary work zone setup:

- Duration of each stop
- Time and distance between stops
- Speed of the work zone while in motion
- Overall distance covered by the operation during the work period
- Speed and volume on the roadway
3. MANAGING MOVING WORK ZONES - VEHICLE CONVOYS

A convoy of multiple vehicles may be necessary

- Typically use shadow vehicle especially at high speeds or volumes
- Some operations require multiple vehicle convoy

Work convoys may provide several distinct advantages:

- Additional protection of workers
- Enhanced work zone conspicuity
- Extended work area provides additional time for materials to dry
- Staggering of vehicles allows for more effective channelization
3. MANAGING MOVING WORK ZONES - CAUTION WITH MOBILE CONVOYS

Protect convoy against unsafe passing and errant vehicles:

- Appropriate buffer spacing and adequate shielding
- Truck-mounted arrow boards or PCMS
- Truck-mounted attenuators on all shadow vehicles
- Proper roll-ahead distances (spacing between vehicles)
- Pull over periodically to allow queues to pass
- Perform work during off-peak hours or at night
4. MAINTAINING ACCESS

Maintain access to intersections, driveways, and on-street parking if possible

Driveway/intersection closure
- Consider the development of queues
- Use flaggers
- Divert to an alternative entry point if possible
- Signed detours are impractical for such a short work period

On-street parking closure
- Minimize the number of stalls closed in high-demand areas
- Ensure shielding of workers with devices and buffer spaces
- Special attention prior to work zone if metered
5. ACCOMMODATING PEDS, BIKES & TRANSIT

- Identify presence of peds, bikes, and transit stops in work zone
- Determine how work activity will impact ped/bike movement
  - Sidewalks/crosswalks
  - ADA accommodation
  - Bike lanes/paths
  - Transit stops
- Use TCDs to provide safe diversion route
  - Even for short-duration operations
  - Separate motorized and non-motorized traffic streams
6. TEMPORARY RE-OPENING OF TRAVEL LANES

Peak period lane restrictions
- Planned maintenance may be restricted to off-peak
- Re-open affected travel lanes during peak periods

If work is not complete:
- Move work crews, equipment, and devices off the roadway
- Cover or shield of any holes or other defects in the pavement.
- Maintain appropriate TCDs to alert motorists
- Work may be completed after peak period
Aerial trucks (bucket trucks, cherry pickers, or scissor lifts) are commonly used in STSD work zones.

Often require specialized TTC
- Refer to state and local standards

Buckets should not be extended over active traffic
- Use flaggers to close lanes if necessary

Use TMA at non-intersection locations
HOW WOULD YOU LIKE TO BE UNDERNEATH THIS?
## Short-Term Work Zone Strategies

<table>
<thead>
<tr>
<th>Work Site Characteristics</th>
<th>Conditions Requiring Revisions to Standard TA and/or Field Adjustment</th>
<th>Possible Mitigation Strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work on traveled way</td>
<td>Driveway access&lt;br&gt;Turning movement at intersection&lt;br&gt;Lane closure interferes with land access</td>
<td>Use flagger&lt;br&gt;Turning movement prohibition&lt;br&gt;Use alternate access where feasible&lt;br&gt;Advance warning for lane closure, turn prohibition</td>
</tr>
<tr>
<td>Work in crosswalk or on sidewalk</td>
<td>Pedestrian facility continuity</td>
<td>Sidewalk detour&lt;br&gt;ADA compliant&lt;br&gt;Portable barrier</td>
</tr>
<tr>
<td></td>
<td>Pedestrian crossing interruption</td>
<td>Pedestrian detour signs&lt;br&gt;Use flagger</td>
</tr>
<tr>
<td>Work on traveled way requiring lane closure</td>
<td>Traffic congestion and unacceptable level of service</td>
<td>Consider advance warning&lt;br&gt;Peak hour break for work&lt;br&gt;Plan for off-peak work</td>
</tr>
<tr>
<td>Presence of grade/ horizontal curve</td>
<td>Sight distance problem due to grade</td>
<td>Move lane closure taper to top of vertical curve&lt;br&gt;Use arrow board</td>
</tr>
<tr>
<td></td>
<td>Sight distance problem at horizontal curve</td>
<td>Provide lane closure taper and arrow board at the tangent section</td>
</tr>
<tr>
<td>WORK SITE CHARACTERISTICS</td>
<td>CONDITIONS REQUIRING REVISIONS TO STANDARD TA AND/OR FIELD ADJUSTMENT</td>
<td>POSSIBLE MITIGATION STRATEGIES</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>-----------------------------------------------------------------------</td>
<td>---------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>
| High speed, high volume roadway           | Work requiring open cut adjacent to travel lane                        | Use mobile barriers for worker and road user protection  
Perform work during off-peak period     |
| Roadways with driveway                    | Short-term paving operation blocking access to driveways               | Use intermediate flagger to control limited access to driveways, as appropriate             |
| Underground utility work on busy highway  | Peak hour work infeasible due to congestion                            | Schedule off-period work  
Multiple phase short-term work  
Use steel plate to cover open portion of travel lane during work period |
# Short-Duration Work Zone Strategies

<table>
<thead>
<tr>
<th>Work Site Characteristics</th>
<th>Conditions Requiring Revisions to Standard TA and/or Field Adjustment</th>
<th>Possible Mitigation Strategies</th>
</tr>
</thead>
</table>
| **Work beyond shoulder**  | Work vehicle placement                                               | Work vehicle with dominant light  
                            |                                                     | Work vehicle with mounted arrow panel  
                            |                                                     | Lane closure with TCD if work vehicle on shoulder/travel lanes |
| **Work on shoulder**      | Interrupts sidewalk                                                  | Provide sidewalk detour signs (portable)  
                            |                                                     |                                                            |
| **Work on traveled way**  | Work vehicle on traveled way                                         | Lane protection by TCD  
                            |                                                     | Lane protection by flagger  
                            |                                                     | Provide advance warning as appropriate  
<pre><code>                        |                                                     | Shadow vehicle with TMA |
</code></pre>
<p>| <strong>-At or near intersection</strong> |                                                                     |                                |</p>
<table>
<thead>
<tr>
<th>WORK SITE CHARACTERISTICS</th>
<th>CONDITIONS REQUIRING REVISIONS TO STANDARD TA AND/OR FIELD ADJUSTMENT</th>
<th>POSSIBLE MITIGATION STRATEGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workers on foot</td>
<td>Must properly protect field workers on foot</td>
<td>Work/shadow vehicle with dominant devices, arrow panel</td>
</tr>
<tr>
<td>High-speed traffic</td>
<td>Increased potential for errant vehicles and/or higher-speed collisions</td>
<td>Temporary rumble strips Shadow vehicle(s) with warning devices Dominant devices Arrow panel Provide law enforcement officers/vehicles</td>
</tr>
<tr>
<td>High-traffic volumes</td>
<td>Increased potential for errant vehicles and/or formation of queues</td>
<td>Consider staging of construction Off-peak period work Shadow vehicle(s) Portable changeable message sign Arrow board Provide alternate routes/diversions</td>
</tr>
</tbody>
</table>
# Mobile Work Zone Strategies

<table>
<thead>
<tr>
<th>Work Site Characteristics</th>
<th>Conditions Requiring Revisions to Standard TA and/or Field Adjustment</th>
<th>Possible Mitigation Strategies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lack of paved shoulders</td>
<td>Shadow and/or work vehicles often are intended to travel along shoulder</td>
<td>Consider staging of construction&lt;br&gt;Off-peak period work&lt;br&gt;Shadow vehicle(s)&lt;br&gt;Portable changeable message sign&lt;br&gt;Arrow board</td>
</tr>
</tbody>
</table>
## MOBILE WORK ZONE STRATEGIES

<table>
<thead>
<tr>
<th>WORK SITE CHARACTERISTICS</th>
<th>CONDITIONS REQUIRING REVISIONS TO STANDARD TA AND/OR FIELD ADJUSTMENT</th>
<th>POSSIBLE MITIGATION STRATEGIES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roadway includes high frequency of intersections and/or driveways</td>
<td>Vehicles entering/exiting the traffic stream from additional access point</td>
<td>Shadow vehicle(s) Restrict turns Provide alternate access</td>
</tr>
<tr>
<td>Roadway includes significant pedestrian and/or bicycle traffic</td>
<td>Pedestrian and bicycle intrusion</td>
<td>Pedestrian detour signs ADA ramps Pedestrian barriers</td>
</tr>
<tr>
<td>Work expected to be performed during peak period</td>
<td>Peak period congestion</td>
<td>Detour or diversion Advance notification</td>
</tr>
<tr>
<td>Two-lane roadway with tree trimming operations</td>
<td>Mobile tree trimming operation along roadway with significant horizontal and vertical curvature</td>
<td>Maintain flagger stations at end of tangents approaching work zone rather than following work crew at fixed distance</td>
</tr>
</tbody>
</table>
SHORT-TERM WORK ZONE EXAMPLES

Temporary Traffic Control Plans
SHORT-TERM WORK ZONES

Work that occupies a location for more than 1 hour within a single daylight period

Some ambiguity between definition of “short-term” and “short-duration” work zones

- Utility work zones
- Various highway maintenance operations
- Asphalt pavement patching and preventative maintenance operations
- Traffic signal maintenance
ASPHALT PATCHING ON MULTI-LANE DIVIDED HIGHWAY

- Common short-term stationary work zone
- Consider roll-ahead distances of vehicles equipped with TMAs
- Use taller (42”) cones instead of drums
- Keep vehicles and equipment to one side if possible
- Never assume shoulders are safe work areas
MAINTENANCE OPERATION NEAR SIGNALIZED INTERSECTION

- Do not extend bucket over active traffic lane
- Truck-mounted attenuator optional
- Work vehicle should be equipped with high-intensity warning lights
- Advance warning signs should be placed on portable supports
May be necessary to close travel lanes on short notice
  ▶ Use flagger to implement closure without more extensive TTC

Single flagger appropriate when visible to traffic from both directions
  ▶ Add additional flagger where limited visibility

Reduce setup time
  ▶ Portable warning signs
  ▶ Taller (42”) cones instead of drums

Buffer spaces may reduce risks to workers due to errant vehicles
SHORT-DURATION WORK ZONE EXAMPLES

Temporary Traffic Control Layout
Work that occupies a location up to one hour

- Traffic signal maintenance
- Pavement patching or other repair operations
- Surveying operations
- Bridge or other highway element inspections
- Loading or unloading equipment or other pre-work operations
- Utility work zones
- Tree trimming operations
High-intensity warning lights and retro-reflective markings on work vehicles to provide 360° warning

10 feet of paved traveled way must remain

Advance warning signs should be on portable stands

Buckets should not be extended over active traffic
**TREE TRIMMING OR REMOVAL OPERATIONS**

- **DO NOT** assume shoulders areas are automatically safe work areas.
- Traffic cones should be utilized to reduce setup/removal time.
- 10 feet minimum lane width required.
- Prevent falling limbs from injuring workers, pedestrians or motorists.
  - Use of flaggers to temporary stop traffic may be necessary.
Examples include tree trimming or utility work.

Truck-mounted attenuator is optional in this example:
- Include on high speed and/or high volume roadways.

Advance warning signs should be on portable stands to reduce setup time.

10 feet minimum lane width is required.

Buckets should not be extended over active traffic.
MOBILE WORK ZONE EXAMPLES

Temporary Traffic Control Layout
MOBILE WORK ZONES

Work that moves **intermittently** or **continuously**

- Sweeping, debris removal, or other cleaning activities
- Pavement marking installation or removal
- Asphalt cold patching operations
- Rumble strip installation
- Various preventative maintenance operations
Truck-mounted attenuators are optional, but should be used on high speed roadways.

Optional arrow boards and portable changeable message signs may help alert road users.

Work vehicles should pull off roadway periodically to allow queues to dissipate.
Pothole patching may require closure of more than one lane.

Space between vehicles should be minimized.

- Deter road users from driving in between convoy.

Vehicle-mounted signs are not to be obstructed by other work vehicles, equipment, or supplies.

Work should be performed during off-peak daylight hours depending on traffic volumes.

One arrow board should be used for each lane closed.

- Pothole patching may require closure of more than one lane.
Further information on highway work zone safety can be found through the following organizations:

- FHWA Work Zone Safety and Mobility Rule: http://www.ops.fhwa.dot.gov/wz/resources/final_rule.htm
- American Road and Transportation Builders Association: http://www.artba.org/
- Institute of Transportation Engineers: http://www.ite.org/
- Occupational Safety and Health Administration: http://www.osha.gov/
- Texas Transportation Institute: http://tti.tamu.edu
- Transportation Research Board: http://www.trb.org/
Further information on highway work zone safety can be found through the following organizations:

- American Road and Transportation Builders Association: [http://www.artba.org/](http://www.artba.org/)
- Institute of Transportation Engineers: [http://www.ite.org/](http://www.ite.org/)
- Texas Transportation Institute: [http://tti.tamu.edu](http://tti.tamu.edu)
Short-Term Example #1
SHORT-TERM WORK ALONG MID-BLOCK ROADWAY

Road Repair Work

Rice St

Hoolako St
Report of a road repair on right travel lane causing disruption to traffic

Work duration expected to take two to three hours
Site Characteristics

- Mid-block location along a roadway
- Work area on right travel lane
- 25 MPH posted speed limit
- Four travel lanes (10’ wide travel lane)
- No paved shoulder
- Curb & gutter
- Driveways and intersections within TTC area
- Moderate traffic volume eastbound (direction of closure)
- Low traffic volume westbound
STEP 1: COLLECT AND IDENTIFY NECESSARY SITE AND WORK CHARACTERISTICS

Work Characteristics

- Short-term work expected to take two to three hours
- Work vehicles for equipment and materials
- Expect workers on foot within the work area
STEP 2: SELECT APPROPRIATE TYPICAL APPLICATION

- Temporary Traffic Control Plan Selection Software
  - Follow the flowchart logic towards the appropriate plan
  - Be sure to check for state-standards first!

- OR select an appropriate typical application from the MUTCD without using the software

Which plan is the most appropriate for this scenario?
STEP 2: SELECT APPROPRIATE TYPICAL APPLICATION

Using the **TTCP Selection Software**, Figure 31-G is the most appropriate

Dimensions and supplementary notes are also provided

<table>
<thead>
<tr>
<th>DIMENSIONS</th>
<th>FEET</th>
</tr>
</thead>
<tbody>
<tr>
<td>A (Distance Between Signs)</td>
<td>100</td>
</tr>
<tr>
<td>B (Distance Between Signs)</td>
<td>100</td>
</tr>
<tr>
<td>L (Merging Taper Length)</td>
<td>105</td>
</tr>
<tr>
<td>1/2 L (Shifting Taper Length)</td>
<td>55</td>
</tr>
<tr>
<td>Maximum Taper Channelizing Device Spacing</td>
<td>25</td>
</tr>
<tr>
<td>Maximum Tangent Channelizing Device Spacing</td>
<td>50</td>
</tr>
</tbody>
</table>
STEP 3: MODIFY TA BASED ON ADDITIONAL CONSIDERATIONS

Having selected a typical application or example plan, it must still be modified to fit the **specific work/site conditions**.

What is unique/different about the given scenario vs. the selected TA?
STEP 3: MODIFY TA BASED ON ADDITIONAL CONSIDERATIONS

What is unique/different about the given scenario vs. the selected TA?

- Expected short-term nature of the work activity
- Commercial driveways and intersections within the TTC area
- Presence of non-motorized facilities (sidewalk & crosswalk)
STEP 3: MODIFY TA BASED ON ADDITIONAL CONSIDERATIONS

What about the placement of advance warning signs?
STEP 3: MODIFY TA BASED ON ADDITIONAL CONSIDERATIONS

- Relocate the merging taper upstream of work area to avoid the driveway
- Remove temporary solid white lane line
- Relocate advance warning signs to avoid driveways
- Add “No Left Turn” sign on the driveway just opposite to work area
STEP 4: DEVELOP APPROPRIATE TEMPORARY TRAFFIC CONTROL PLAN

Final TTCP should include:

- Schematic drawing of the modified plan including:
  - All necessary temporary traffic control devices
  - Dimensions / layout of devices

- Supplementary notes or guidance for field personnel
  - Instructions on how to modify TTC for various field conditions
STEP 4: DEVELOP APPROPRIATE TEMPORARY TRAFFIC CONTROL PLAN
STEP 5: PERFORM FIELD REVIEW OF TTCP AS APPROPRIATE

Field conditions may vary from expectations

- Especially for unexpected or emergency work

Ensure TTC in place is appropriate for actual conditions

- Heavier than expected vehicular or pedestrian volumes
- More expansive work area than anticipated
- Duration exceeding one daylight period
- Other considerations
Short-Term Example #2
SHORT-TERM WORK ALONG MID-BLOCK DIVIDED ROADWAY
Road repair on right travel lane causing disruption to traffic

Work duration expected to last at least 1 hour

Report of road repair on roadway
STEP 1: COLLECT AND IDENTIFY NECESSARY
SITE AND WORK CHARACTERISTICS

Site Characteristics

- Mid-block location along a divided roadway
- 30 MPH posted speed limit
- Affected roadway includes four travel lanes (11’ wide lanes)
- No paved shoulder and curb and gutter
- Commercial driveways and intersections within TTC area
- Moderate traffic volumes
- Site includes pedestrian facilities (sidewalks & crosswalks), however pedestrian volume is expected to be relatively low
STEP 1: COLLECT AND IDENTIFY NECESSARY SITE AND WORK CHARACTERISTICS

Work Characteristics

- Work duration expected to last 1 to 3 hours
- Work vehicles for asphalt cold mix and materials for road repair
- Expect workers on foot within the work area
- Activities likely to include:
  - Shallow excavation
  - Spot cleaning
  - Cold mix patching
STEP 2: SELECT APPROPRIATE TYPICAL APPLICATION

Temporary Traffic Control Plan Selection Software
- Follow the flowchart logic towards the appropriate plan
- Be sure to check for state-standards first!

OR select an appropriate typical application from the MUTCD without using the software

Which plan is the most appropriate for this scenario?
STEP 2: SELECT APPROPRIATE TYPICAL APPLICATION

Using the **TTCP Selection Software**, Figure 6H-33C is the most appropriate.

- Figure 6H-33 could also be selected from the MUTCD.

Dimensions and supplementary notes are also provided.

<table>
<thead>
<tr>
<th>DIMENSIONS</th>
<th>FEET</th>
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<tbody>
<tr>
<td>A (Distance Between Signs)</td>
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<td>100</td>
</tr>
<tr>
<td>C (Distance Between Signs)</td>
<td>100</td>
</tr>
<tr>
<td>L (Merging Taper Length)</td>
<td>165</td>
</tr>
<tr>
<td>1/3 L (Shoulder or Parking Lane Taper Length)</td>
<td>55</td>
</tr>
<tr>
<td>Maximum Taper Channelizing Device Spacing</td>
<td>30</td>
</tr>
<tr>
<td>Maximum Tangent Channelizing Device Spacing</td>
<td>60</td>
</tr>
</tbody>
</table>
STEP 3: MODIFY TA BASED ON ADDITIONAL CONSIDERATIONS

Having selected a typical application or example plan, it must still be modified to fit the **specific work/site conditions**.

What is unique/different about the given scenario vs. the selected TA?
STEP 3: MODIFY TA BASED ON ADDITIONAL CONSIDERATIONS

What is unique/different about the given scenario vs. the selected TA?

- Expected short-term nature of the work activity
- Presence of commercial driveways and intersections along the TTC area
- Presence of non-motorized facilities (sidewalks & crosswalks)
- Presence of series of trees covering the right lane which may obscure TTC components
STEP 3: MODIFY TA BASED ON ADDITIONAL CONSIDERATIONS

What aspects of the Figure 6H-33C should be modified to fit the work/site conditions?

- “End Road Work” sign
- Optional end taper
- Shoulder taper
- Optional buffer space
- Optional TMA
- Arrow board
STEP 3: MODIFY TA BASED ON ADDITIONAL CONSIDERATIONS

Merging taper within a driveway in advance of work area?

How do you handle this situation?
STEP 3: MODIFY TA BASED ON ADDITIONAL CONSIDERATIONS

What about the placement of advance warning signs?
Sight Obstructions?
STEP 3: MODIFY TA BASED ON ADDITIONAL CONSIDERATIONS

- Consider omitting optional “End Road Work” sign
- Remove end taper
- Omit optional TMA
- Omit arrow board
- Remove shoulder taper
- Extend the buffer space up to the driveway
- Shift the merging taper and advance warning signs accordingly
Final TTCP should include:

- Schematic drawing of the modified plan including:
  - All necessary temporary traffic control devices
  - Dimensions / layout of devices

- Supplementary notes or guidance for field personnel
  - Instructions on how to modify TTC for various field conditions
STEP 4: DEVELOP APPROPRIATE TEMPORARY TRAFFIC CONTROL PLAN

Proposed Work Area

90'

165'

100'

100'

100'

ROAD WORK XX MILE

RIGHT LANE CLOSED XX MILE
STEP 5: PERFORM FIELD REVIEW OF TTCP AS APPROPRIATE

Field conditions may vary from expectations
▶ Especially for unexpected or emergency work

Ensure TTC in place is appropriate for actual conditions
▶ Heavier than expected vehicular or pedestrian volumes
▶ More expansive work area than anticipated
▶ Duration exceeding one daylight period
▶ Other considerations
POST-TEST AND EVALUATIONS
WORK ZONE SAFETY
COMPRENDIUM OF
DOCUMENTS
SEARCH ENGINE
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Was prepared in cooperation with USDOT and FHWA.

The Work Zone Safety Compendium of Documents Search Engine is a ‘Living Document’ and may be modified and updated as needed.
WORK ZONE SAFETY COMPENDIUM OF DOCUMENTS SEARCH ENGINE

- Workzone.eng.wayne.edu
- Developed as a part of the 2011 FHWA Work Zone Safety Grant
- Customized search engine of all documents relating to highway work zones
WORK ZONE SAFETY COMPENDIUM OF DOCUMENTS SEARCH ENGINE

- State Standard Plans
- State Work Zone Practices
- MUTCD & State Supplements
- Research Reports
- Standards & Specifications
- Public Awareness & Outreach
- Tools & Guidelines
- Temporary Traffic Control Product Information
- Laws & Regulations
- Journal Articles & Conference Proceedings
Please note:

- Certain results may appear in multiple categories to ensure users find what they are looking for.

- WSU updates the document database on a regular basis – however – some documents may become out of date.

- Document database should be comprehensive – however – some items may be missing.
  - Please alert WSU if you are aware of any document that needs to be added.